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CABLE LOCATOR
SUCCESS CBI-309N

TECHNICAL DESCRIPTION
OPERATING INSTRUCTIONS

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Introduction

This Operation manual contains description of the cable route locator AP-019.1, its working modes, and information necessary for its proper use. AP-019.1 (hereinafter «the receiver» or «the device») can be used and a individually, and in the composition of the locating sets. The receiver works at the networks frequencies 50(60) Hz, 100(120) Hz, and with the use of the route locating transmitters at frequencies 512Hz, 1024 Hz, 8192 Hz, 32768 Hz («33 kHz»).

Cable locator «Success CBI-309N» is used for:

- Detection of energized cables underground in two modes: “ROUTE” and “CHART” ;
- Direct digital measurement of the depth up to 10 m of the cable;
- Indication of the deviation from the utility axis in the mode “ROUTE” on LCD display;
- Measurement of the current in the utility on the operating frequency;

Intended use

- Power and heat power engineering
- Public utilities
- Oil and gas industry
- Geodesy
- Communication
- Construction
- Other industries

Operation conditions

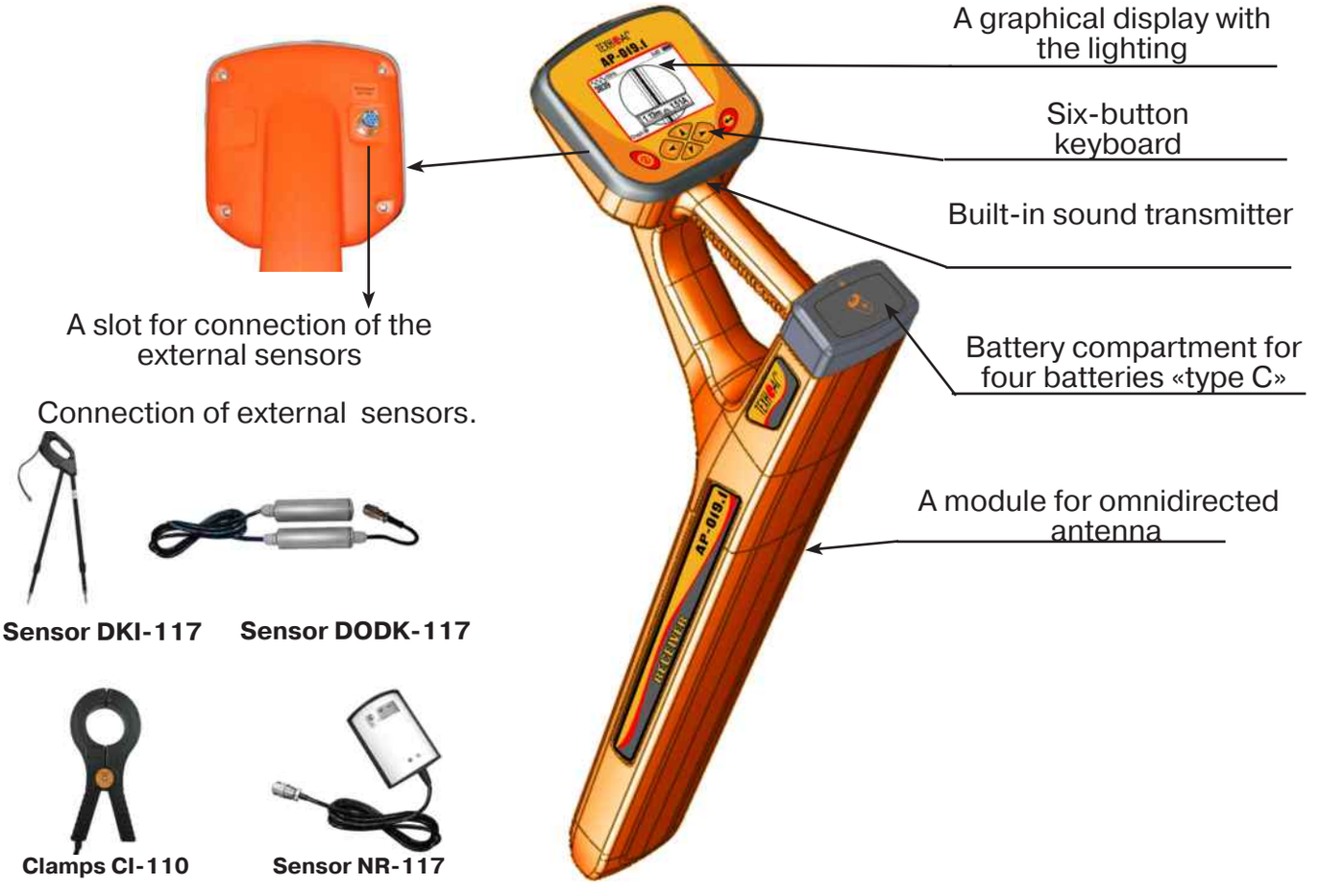
-Ambient temperature, ˚C .....from -20C to +60
-Relative humidity, % .....up to 85 at t=35 ˚C
-Pressure, kPa,.....84 to 106
-Device protection class..... IP 54

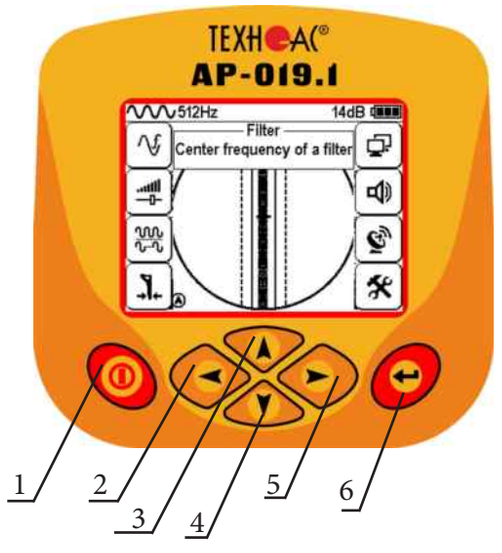
Cable locator «Success CBI-309N» working principle

The working principle is based on the analysis of the electromagnetic field, created by the alternative current flowing through communications. The electrical signals induced in the receiver sensors are amplified, filtered, processed by the processor and displayed on the graphical display in the form of the communication position line, linear scale, and the graphic of the signal level change, digital value of the signal level amplification coefficient, distance to the communication axis, the value of the current flowing through it, and other parameters.

1. Appearance, AP-019.1 receiver controls

AP-019.1 receiver is made in the solid cast IP54 body, to the battery compartment the body provides the protection IP68, the device can be splitted in three components: the face panel with controls and displays, battery compartment and bottom part with the antenna block. On the back side of the face panel, there are two slots for connection of external sensors.





Face panel, controls

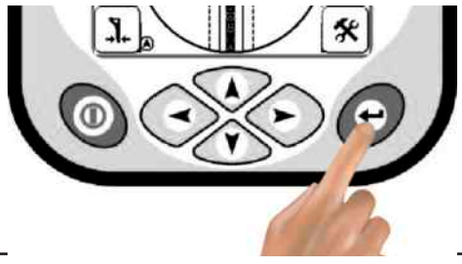
	«Power» button (1) Switching on/off the receiver
	«Enter» button (6) - calls out a menu, - enters into the editing mode of the selected menu option, - exit for the editing mode saving selected parameters.
	Buttons «Up» (3), «Down» (4), «Right» (5), «Left» (2). - selection of the menu option (icon), - selection or changing the parameter inside the menu, - operative change in the parameters

2. Receiver menu description

2.1 Receiver switching on and menu call

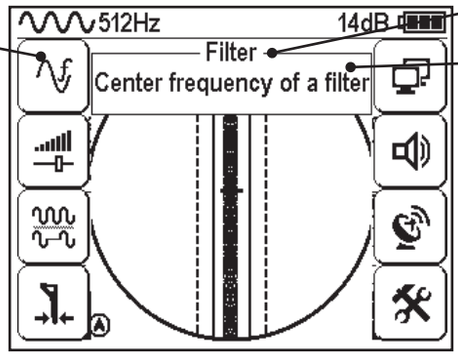
To switch on the receiver press the button «Power»

Press «Enter» button to open the Menu



2.2 The general view of the menu screen

The selected menu option is highlighted with the dotted line, flashes with light/dark

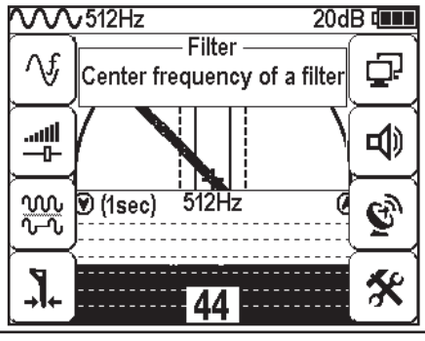


menu option name

brief menu option description

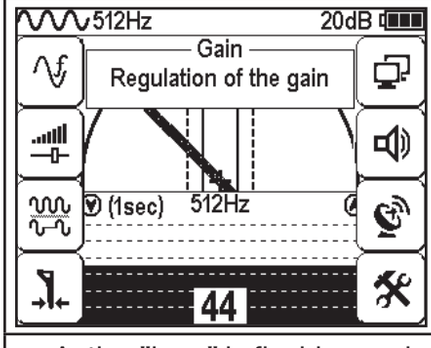
2.3 Menu parameter selection

To open the menu press «Enter».



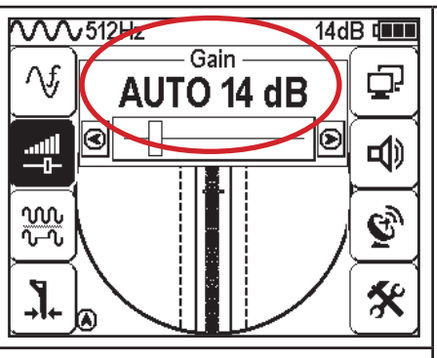
The menu will appear on the screen.

Menu option selection is performed with buttons «Up», «Down», «Right», «Left».



Active "icon" is flashing and highlighted by dotted line

to change or view the menu item



In the upper part of the indicator the parameter editing panel will open.

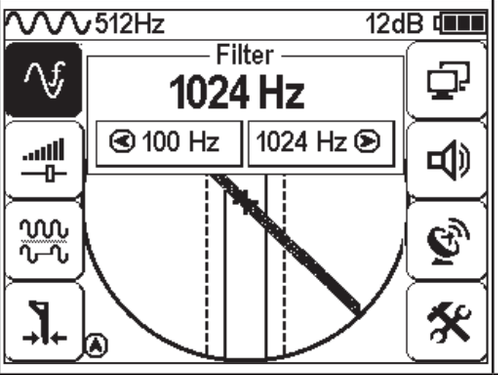
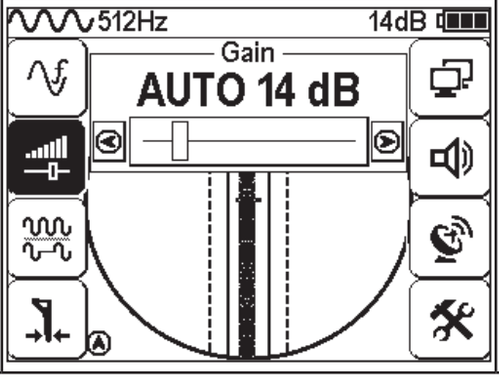
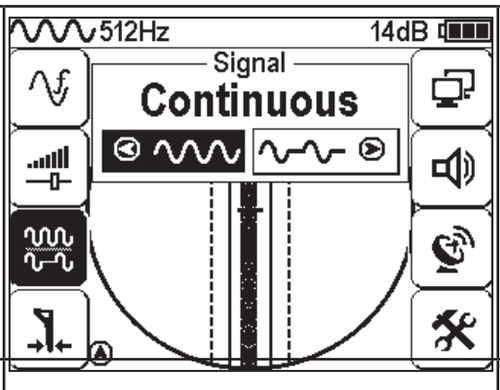
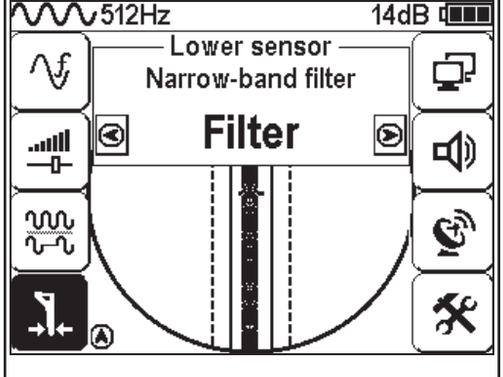
The changed value is immediately applied.

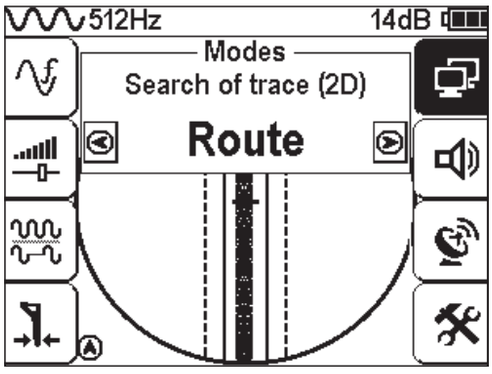
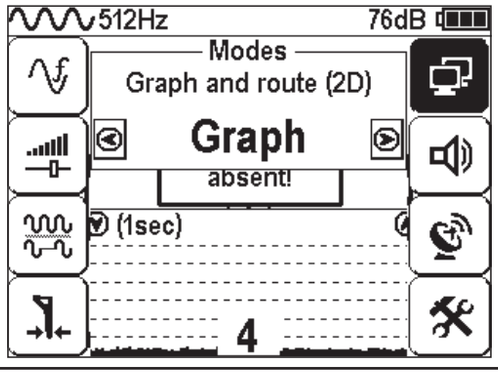
To exit the menu to the general menu or transfer to the set mode with the closing of the menu, you should press the button «Enter».
If you wait for several seconds, menu icons will disappear.

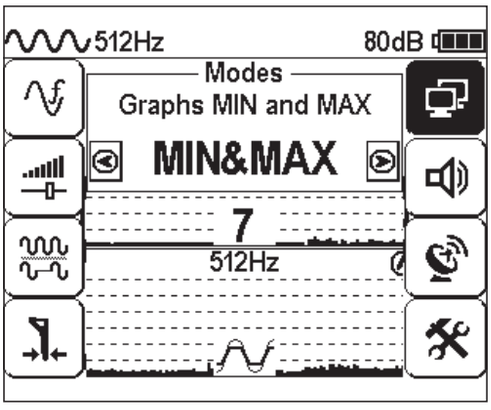
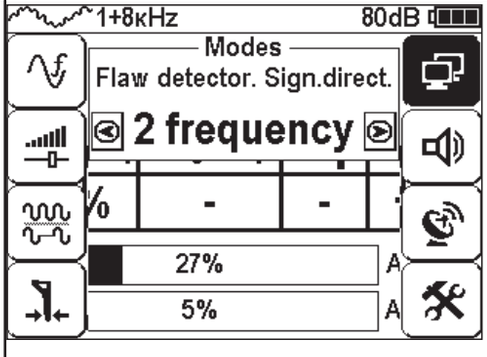
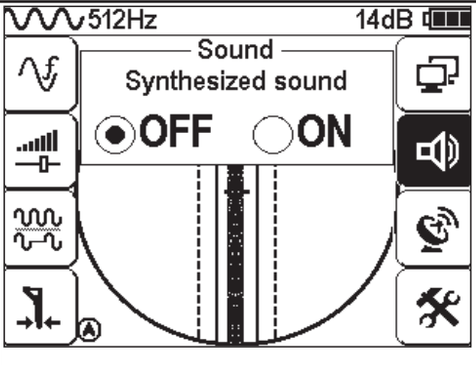
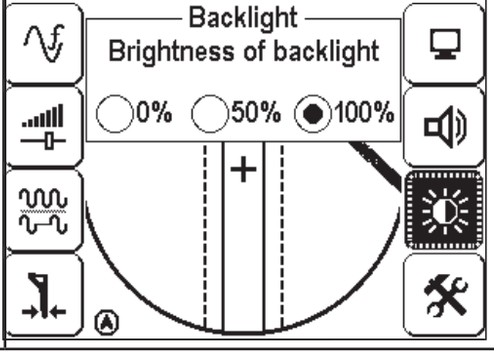
If you don't press any buttons for a period of time, the menu will disappear automatically. The length os this period is set in the corresponding menu option (see Table 1. p.6)

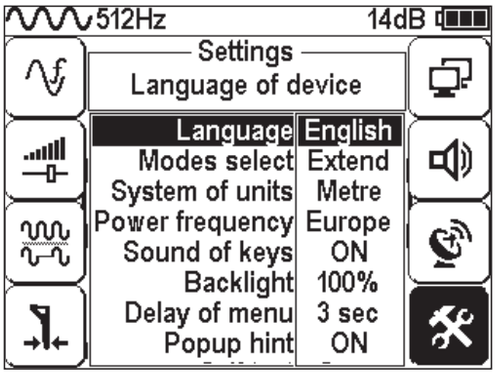
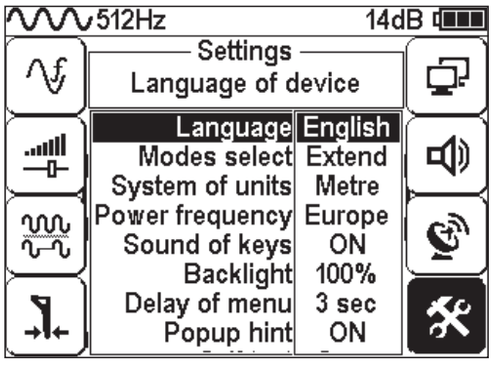
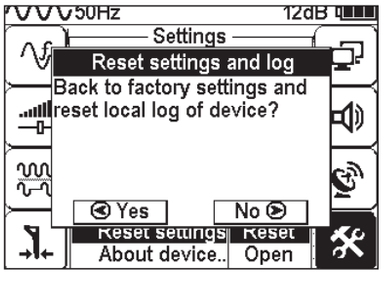
thirteen items of menu contain parameters of setting, which are opened in the panel located in the upper part of the indicator.

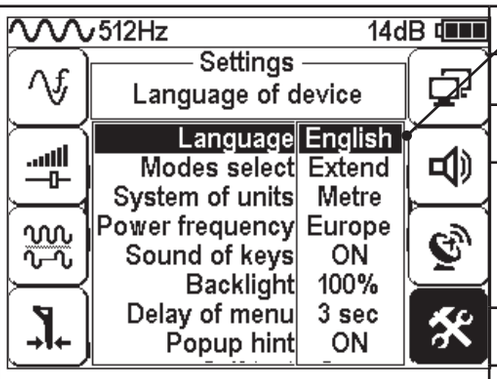
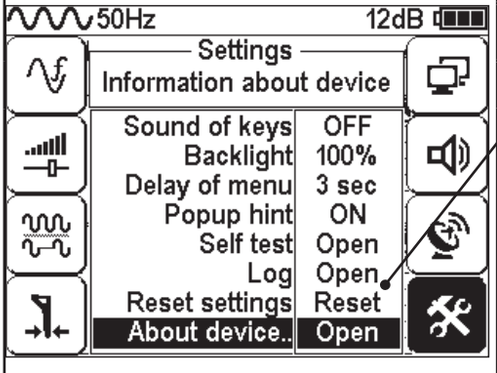
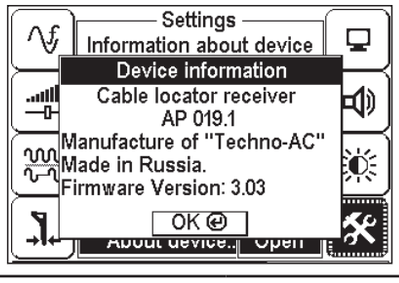
Table 1

№	Item of the menu	Display image	Parameter description
1	Filter		The working frequency of the receiver It is selected from the set: **50(60) Hz, 100(120) Hz, 512 Hz, 1024 Hz, 8192 Hz 32768 Hz.**
2	Gain		The amplification coefficient of the scaling amplifier can be changed from **0 dB to 80 dB** with 2 dB step. The optimum coefficient of amplification can be selected: **- manually,** -**semiautomatically** (by a command), -**automatically** depending on the regime of the analysis and signal representation.
3	Signal		The type of signal received can be **«Continuous»** or **«Impulse»**.
4	Advanced bottom sensor setting		This option has several settings affecting the efficiency og bottom sensor. - **«Filter»** (all filters enabled) - **«WS»** (all fillter disabled, sensor receives all frequencies below 8kHz). - **«Radio»** sensor receives all frequencies over 8kHz. 'Filter' setting is used only in 'Route mode', other settings are used in 'Graphic' mode.

5	Base Mode		**Set of modes:** - **«Route»** (2D display of the location of the route cable;
6	Base Mode		- **«Graphic»** (visually represents the changes of signal level of surveyed cable);

7	**Advanced** Modes		**Advanced of mode:** - **«minimum maximum»** (graph representation of minimum and maximum signals)
8	**Advanced** Modes		**Advanced mode:** «2 frequency» (simultaneous operation in two frequencies, also know as frend-or-foe mode).
9	Sound		Switching on / switching off of tsound notifications the created by the built-in speaker.
10	Backlight		It sets the brightness of the LED display. It has following values:: - 0% - 50% - 100%

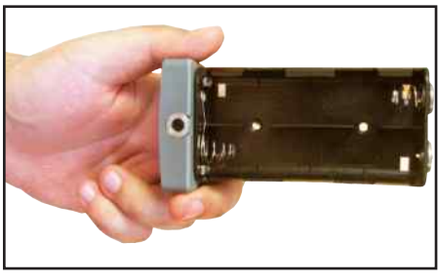
<table>
<tr>
<td>11</td>
<td>Settings
 </td>
<td> 
</td>
<td>
<table>
<tr><td colspan="2">This menu is opened in the main field of an indicator</td></tr>
<tr><td>Language</td><td><Russian/English></td></tr>
<tr><td colspan="2">Locale of the device</td></tr>
<tr><td>Measurement system</td><td><Meter/Foot></td></tr>
<tr><td colspan="2">Measurement system: metrical or imperial</td></tr>
<tr><td>Network frequency</td><td><Europe/USA></td></tr>
<tr><td colspan="2">The network frequency for passive search: «Europe» (50 и 100 Hz) / «USA» (60 and 120 Hz).</td></tr>
</table>
</td>
</tr>
<tr>
<td>12</td>
<td>Settings
 </td>
<td> 
</td>
<td>
<table>
<tr><td>Sound of keys</td><td><ON/OFF></td></tr>
<tr><td colspan="2">Disables keys sound</td></tr>
<tr><td>Delay of menu</td><td><1 sec/2 sec/ 3 sec/ 4 sec/5 sec></td></tr>
<tr><td colspan="2">Time-out before closing the menu when no buttons are pressed.</td></tr>
<tr><td>— Popup hints</td><td><ON/OFF></td></tr>
<tr><td colspan="2">Disables pop-ups with useful hints.</td></tr>
<tr><td>Reset settings</td><td><Reset></td></tr>
<tr><td colspan="2">Resets the receiver to factory settings
 
</td></tr>
</table>
</td>
</tr>
</table>

13	Settings		**Modes select**	basic / advanced
			Available modes select	
			Basic	Advanced
			About device	
			about device	<Open>
			Information about the device will pop-up in a dialog window. 	

3. Start of work

Before start of work, you should install the batteries into the corresponding compartment of the receiver in the following sequence:

Battery compartment will unsnap. Pull out the ring on the receiver handle

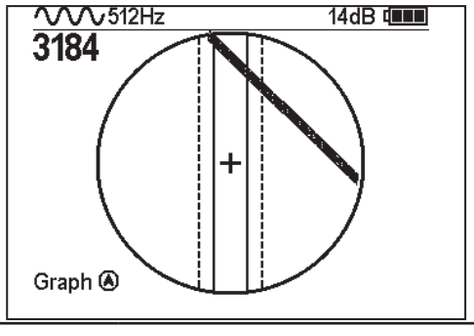
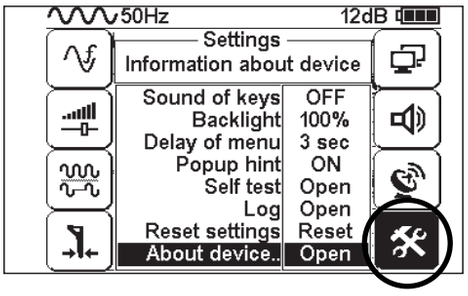


Remove the battery compartment from the receiver body

Install four new elements into the battery compartment of the device, minding polarity Install the battery compartment into the body until it snaps.

Receiver switching on

To switch on the receiver press the button «Power»

The screen saver will appear on the screen with the indication of the **Firmware version** , manufacturer and device name		The screensaver is followed by voltage and battery charge indicator..
Then the receiver will automatically enter into the mode «Route» in 5 seconds. At the first switching the factory settings are set by default. The filter frequency is 50 Hz. 		The description of factory settings can be found in the menu «Parameters». You can go back to factory settings by selecting the parameter «reset settings» 

Note

With factory settings enabled you can perform the cable location with network frequency 50 Hz in without transmitter.

4. Search of cables in the mode «Route»

The Route mode is the main mode for route location of various communications (cables, pipelines) at all frequencies supported by the receiver, both a «passive» cable route location, and at the «active» (with the use of the route locating generator). In the passive mode the cable location is carried out at frequencies **50(60)100(120)Hz**, in the **active mode -512,1024, 8192, 32768 Hz**.

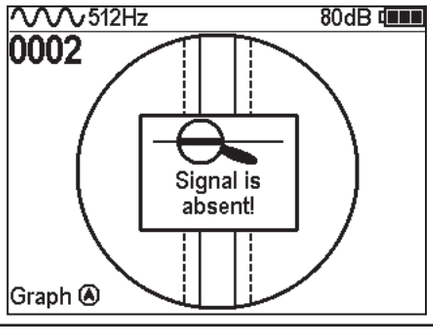
4.1. Cable location in the passive mode

This mode is used to search and locate a route of power cables under voltage with the frequency 50(60) Hz and other communications with the induced signal in frequency 50(60) Hz. The filter set on the receiver - 50(60) Hz. The external generator is not used.

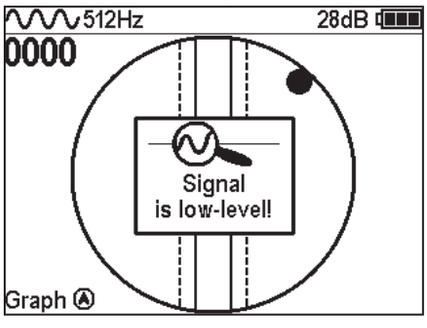
4.2 Search of a communication and measurement of its burial depth.

1. Come to the supposed place of the communication under the voltage or induced voltage in frequency 50(60) Hz.

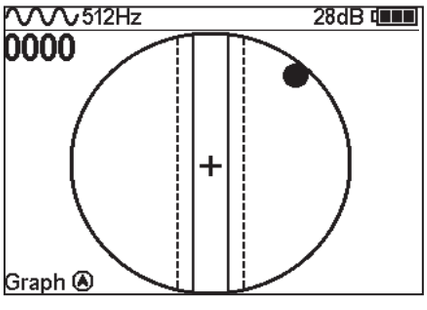
2. If the communication is far from the operator, you will see on the screen:



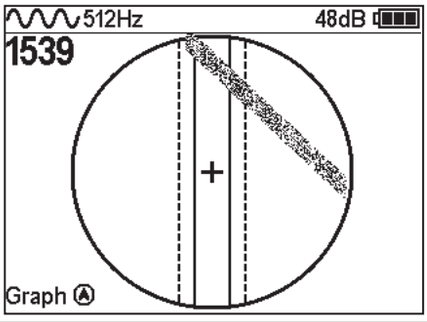
3. When moving towards the supposed place of the communication location, the «ball» will appear on the screen. It shows the presence of communication, and that it is on the significant distance from the operator.



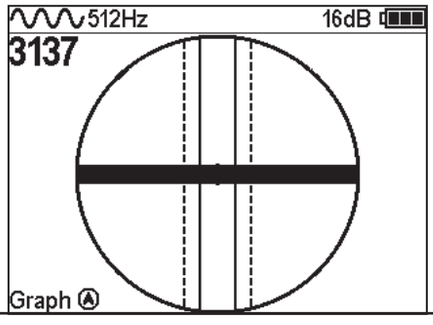
4. The «ball» position shows, in which direction from the operator the communication is located.



5. When approaching to the communication at distance less than the doubled burial depth, the blurred line of the axis pointer will appear.



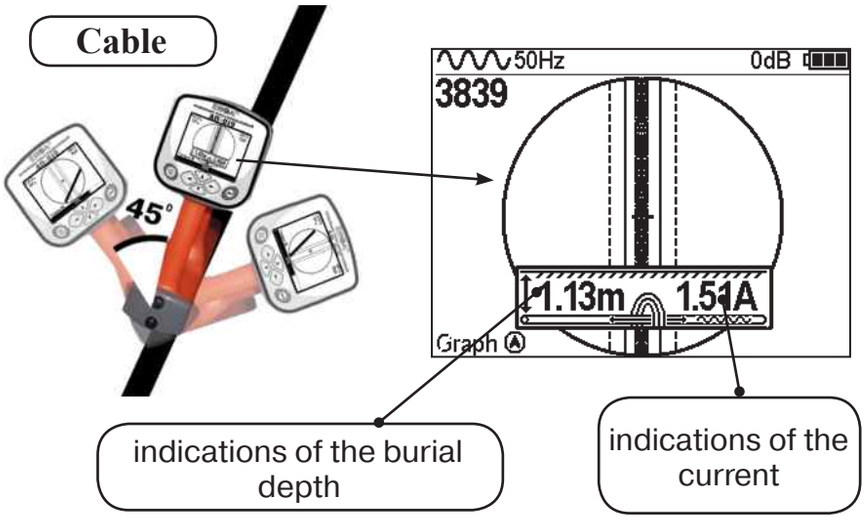
6. When operator moves closer tothe communication, the axis will move to the circle center. This means that the operator is standing strictly over the communication.



The measurement of the burial depth of communication

7. Further you should rotate the device, until the communication axis is aligned along the receiver axis. In this position and f the current in the cable is sufficient the window will appear displaying its burial depth and current. Now, the operator stands alongside the communication.

In this position, it is possible to move forward and trace whole cable.)

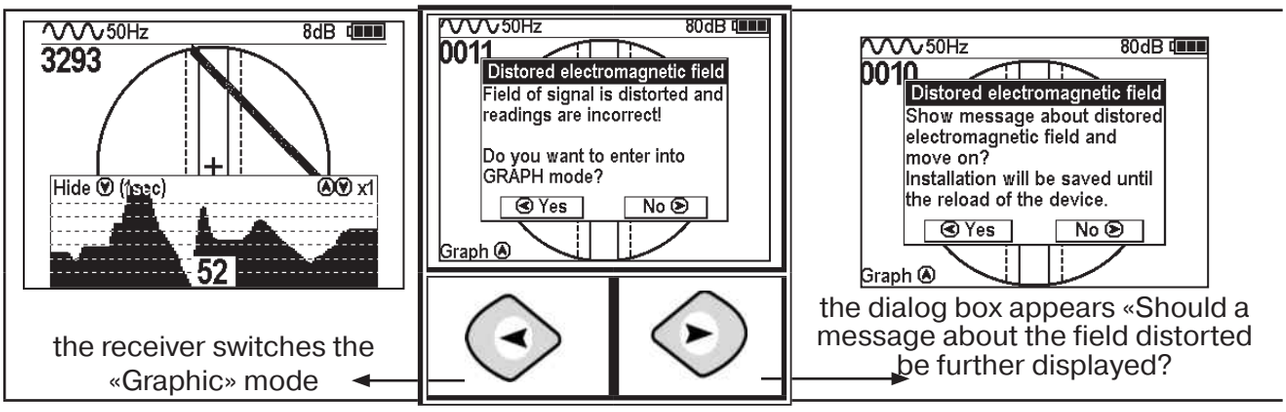


Note

The power cables most frequently lay at the depth of 60-80 cm, allowing to differ them from pipelines. It is possible that cable lays in one channel with the pipeline, when the burial depth can be significantly exceed 1 meter.

If the communication axis cannot be located exactly in the limited area, and the periodical jumps are happening from the one border to the other, it tells about the presence of several cables under voltage with the 50 Hz frequency. You can specify number and position the cables in «Graphic» mode.

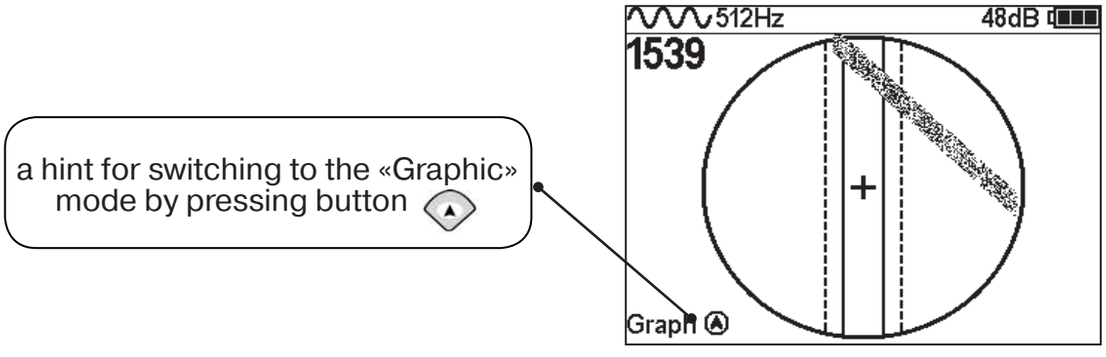
In the case when the signal is significantly distorted, the receiver automatically shows the notice about field distortion, offering switching the mode to 'Graph'



the receiver switches the «Graphic» mode

the dialog box appears «Should a message about the field distorted be further displayed?

4.3 Hot keys for work in the «Route» mode



5. Search of communications in the mode «Graphic»

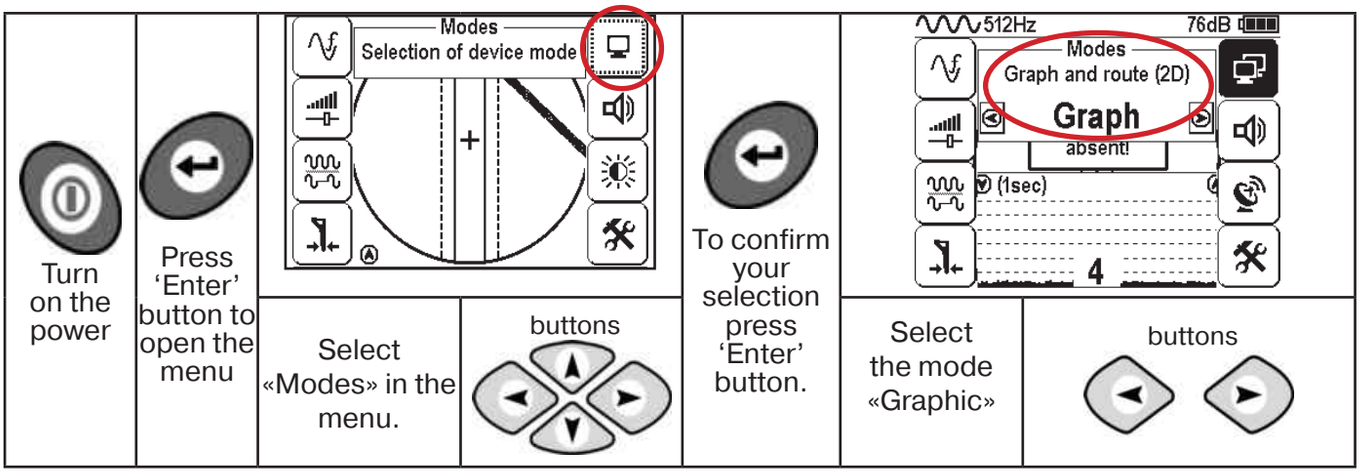
The **«Graphic»** mode of is the support mode and intended to locate various communications (cables, pipelines), both in the passive and active modes with the route locating transmitter. In the passive mode the cable location is carried out at frequencies **50(60), 100(120)Hz**, in the active mode - **512,1024, 8192, 32768 Hz.**

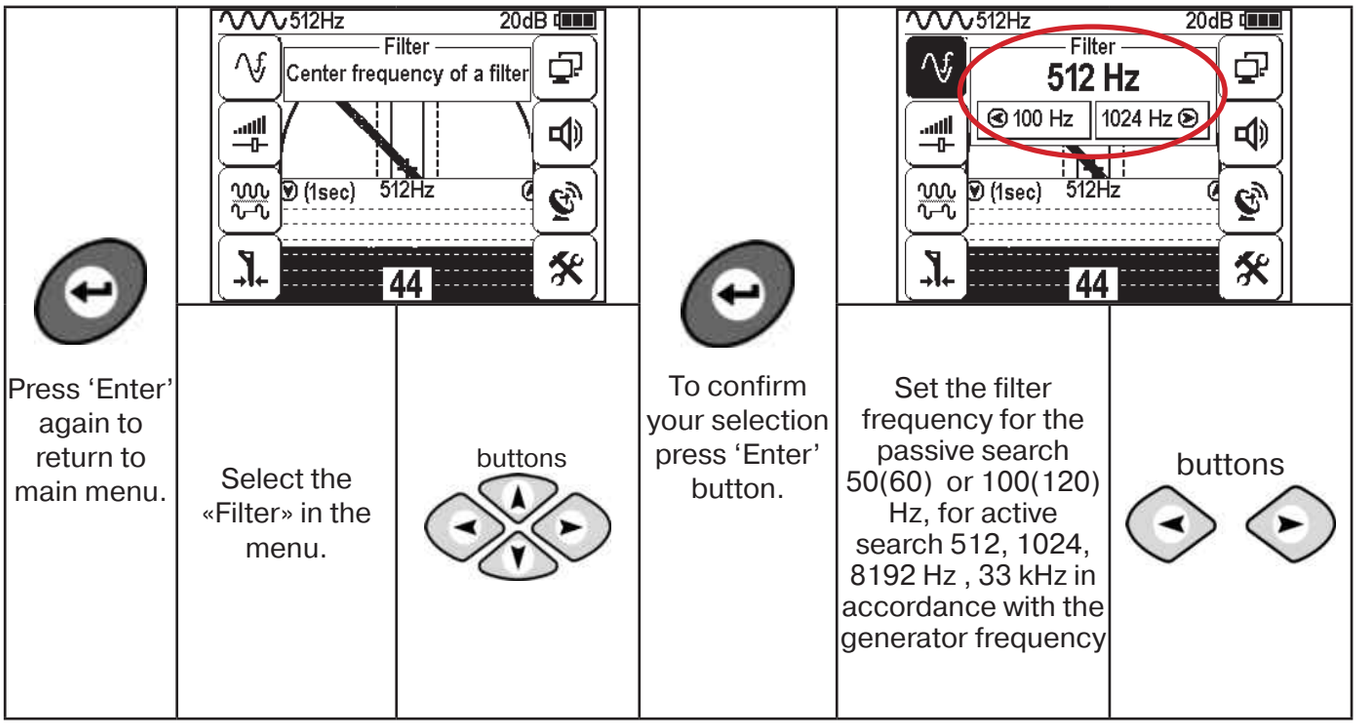
The **«Graphic»** mode is also intended to determine the number of the near located communications. The **«Graphic»** mode allows to perform the route location in the conditions of the low signal on the communication, when the route location in the **«Route»** mode is impossible.

The measurement of the burial depth and current is not available in this mode.

In the **«Graphic»** mode, the receiver screen displays the moving diagram of change in the signal level depending on the time by the 'maximum' method - when located over the communication the signal is maximum, when deviating from the axis - the signal decreases.

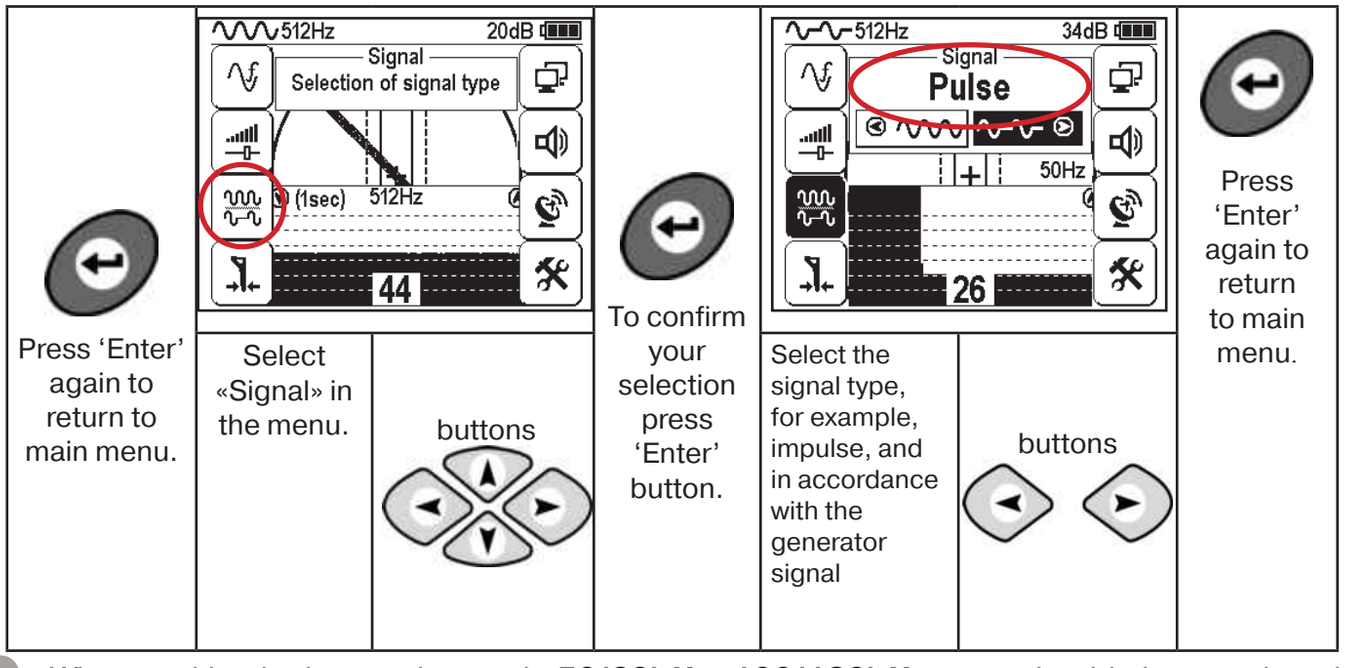
5.1 Setting of the receiver for work in the «Graphic» mode





At the active search, the signal should be transmitted on the route from the generator with the same frequency as on the receiver (p.5.3).

In the **«Graphic»** mode the work is performed in the **«Continuous»** or **«Impulse»** signal. The difference at the work with the **«Impulse»** signal is in that the digit in the center of the analogous scale shows not the current value of the signal, but the maximum value (amplitude) of the transmissions of the interruptible signal from the route locating generator. The pitch of the tone of the sound synthesized also corresponds to the maximum value of the signal for the period of the impulse transmitted.

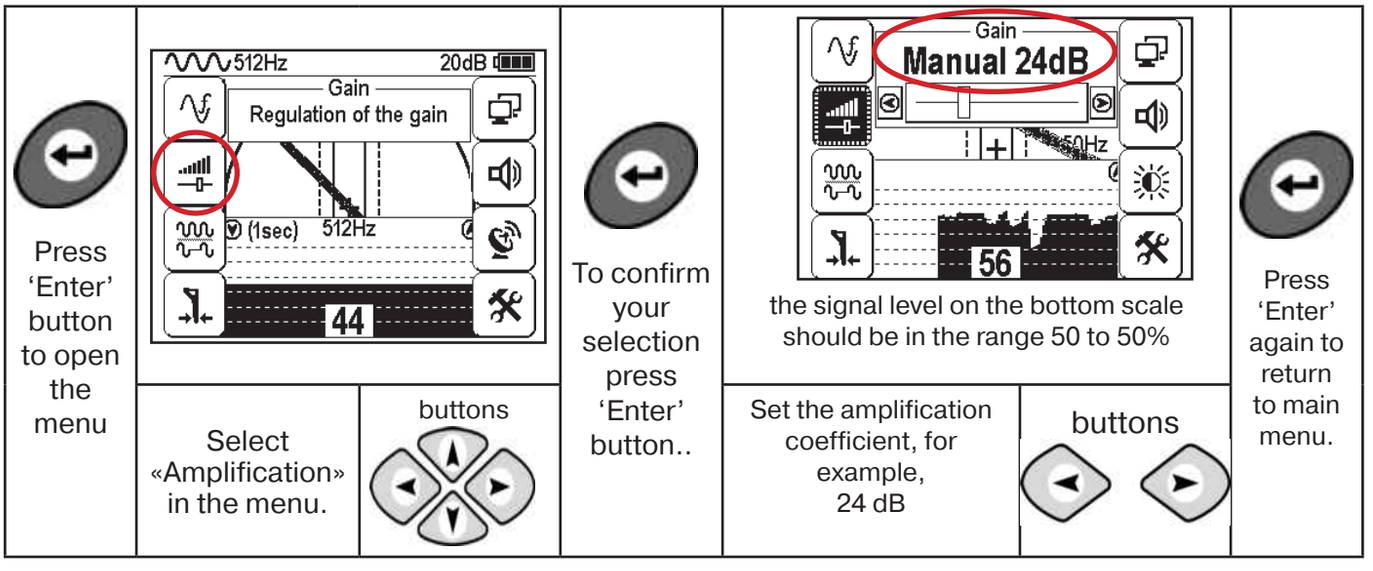


Note

When working in the passive mode **50(60) Hz, 100(120) Hz** - you should always select the **continuous type of the signal.**

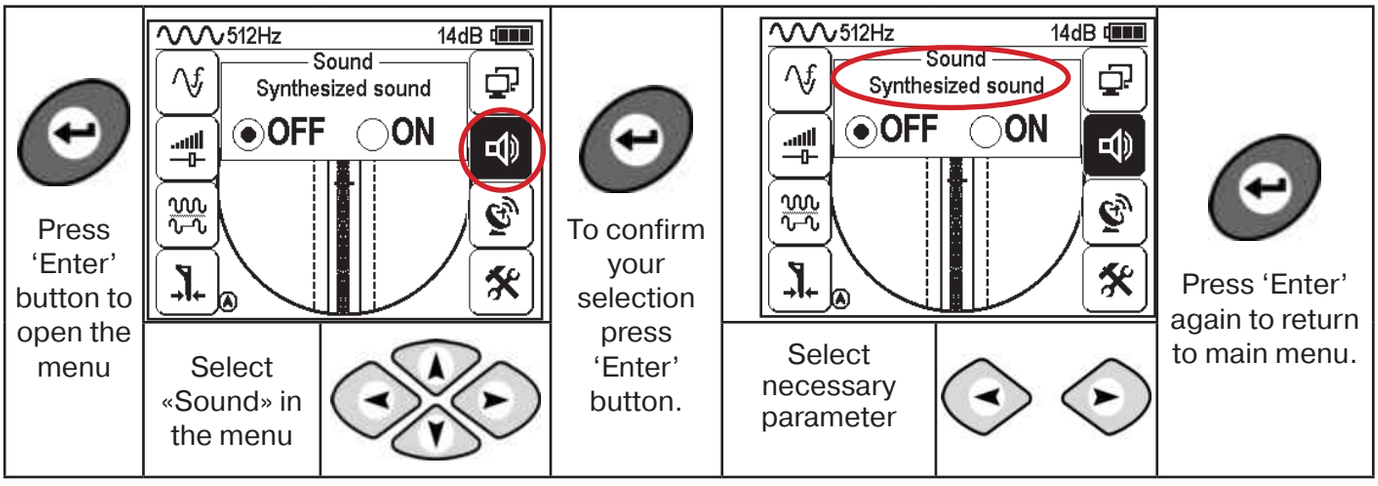
When working with the generator (in the **active mode) 512, 1024, 8192 Hz, 33 kHz** - the type of the signal on the receiver is **continuous or impulse**, in accordance with the signal set on the transmitter.

During the route location, you can manually set the input signal amplification.

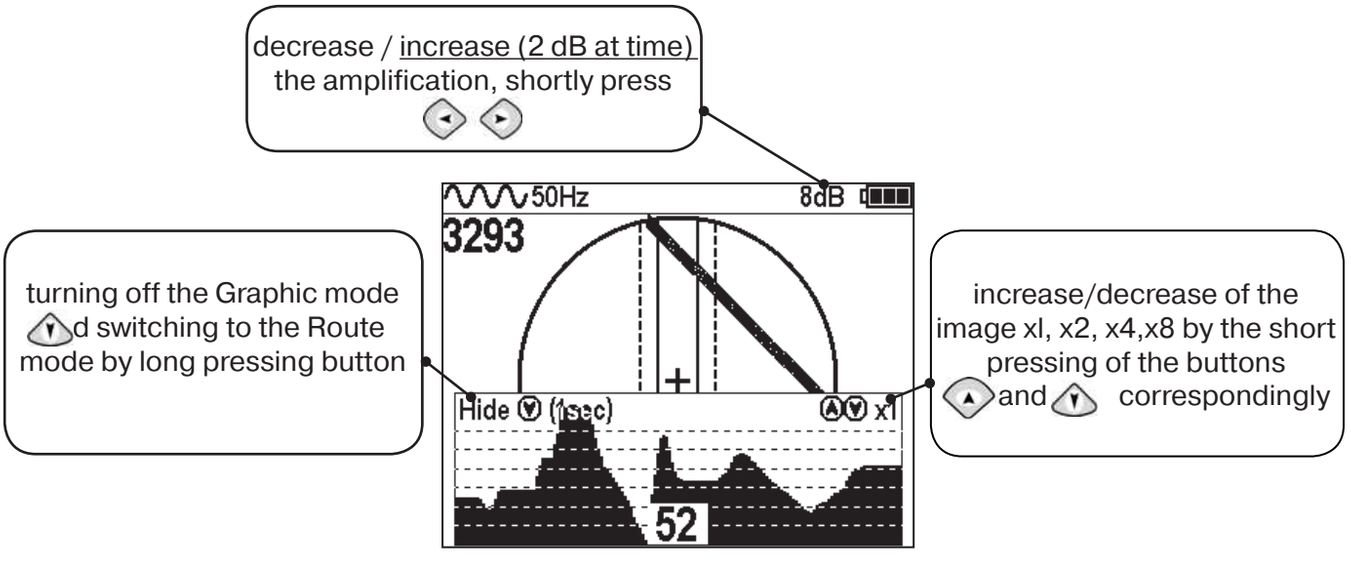


The change of the input signal amplification coefficient should be performed manually by short pressing ◄ ► buttons or semi-automatically by holding one of them pressed for 1 sec.

In the «Graphic» mode it is possible to listen synthesized sound through the built-in speaker. The sound tone pitch changes depending on the signal level.



5.2 «Hot» keys for work in the «Graphic» mode



Note

If the signal occupies the whole graphic (the black string) it is necessary to perform the following actions:

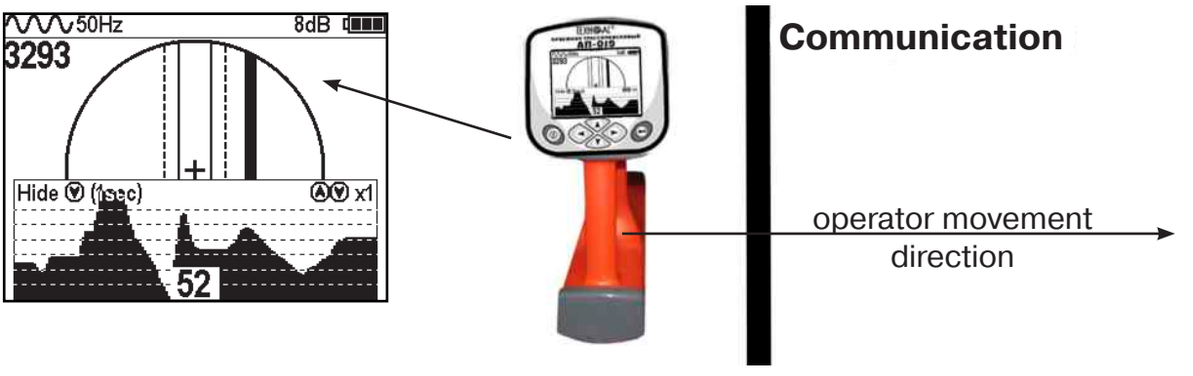
1. Decrease the graphic scale to the value x1 by pressing button

2.Decrease the signal amplification coefficient by pressing button till the appearance of the decrease of the input signal level will be less than 80%.

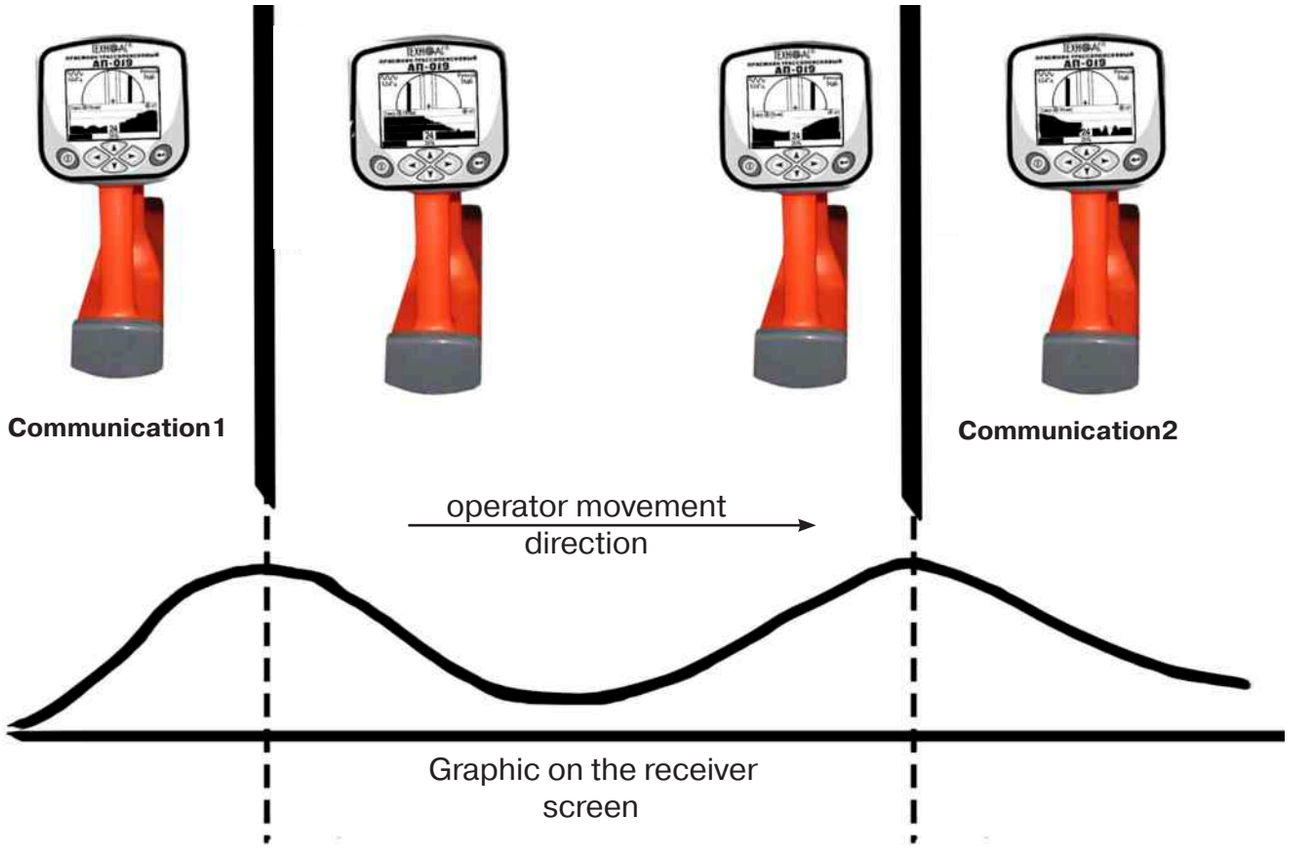
3.In case of low signal, increase the amplification coefficient by pressing button and the scale by pressing button.

5.3 Search of communications in the mode «Graphic»

1. Perform the receiver setting - select the Graphic mode
2. Locate the receiver in parallel to the supposed axis of the communication, slowly move in direction as shown on the figure.



At presence of two communications, the approximate view of the graphic on the receiver screen is given on the figure:



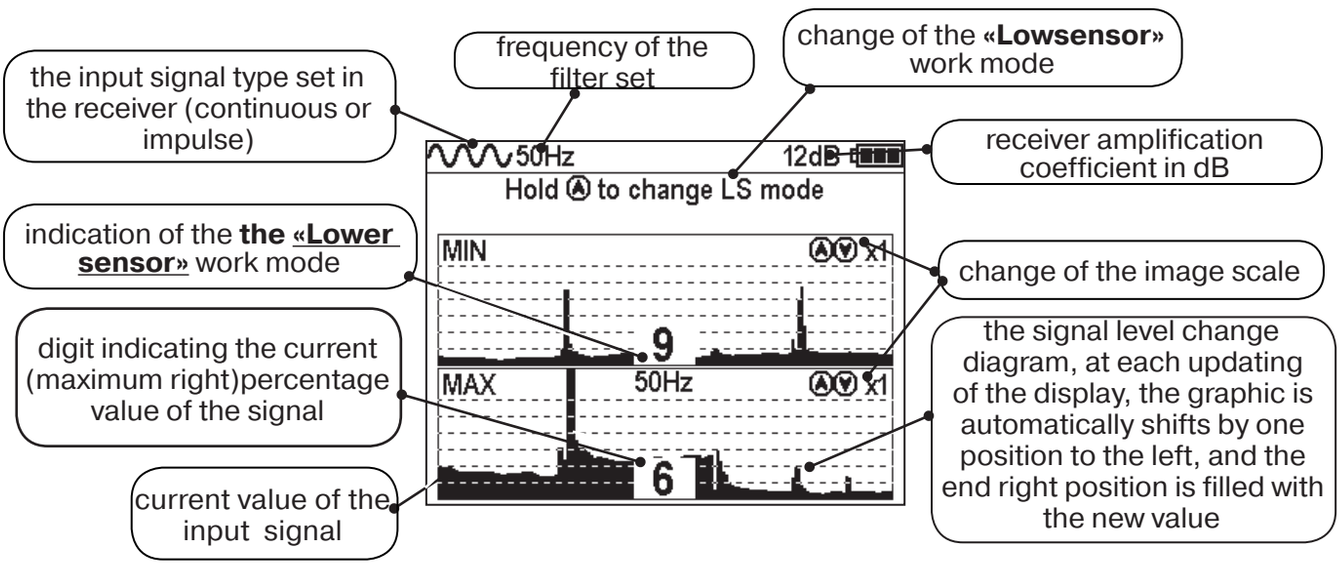
4. You should locate the place of communication by the maximum signal level.

6. Perfoming the cable location in the mode «Minimum maximum»

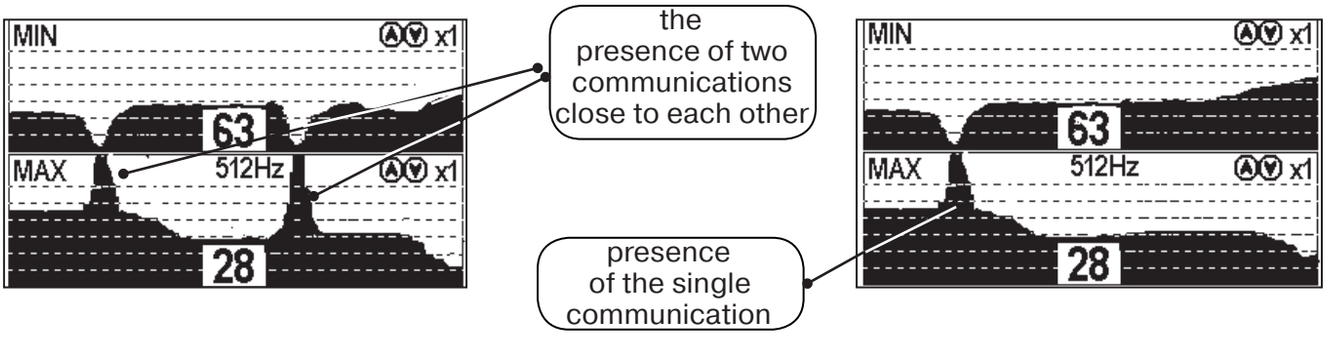
In the mode **«Minimum maximum»**, the device works simultaneously both on the method «maximum» and method **«minimum»**. This mode is used in the conditions of the distorted field, in the presence of the nearby utilities, at the low induced signal. It allows to perform location, to determine presence and location of the utilities located nearby.

In the **«Minimum maximum»** mode the receiver display is divided in two halves. The moving diagram of the signal level change is displayed in the upper part by the **«minimum»** method - when located over the cable the signal is minimal, when deviating from the axis - the signal increases, in the bottom part - the moving diagram of the signal level change depending on the time by the «maximum» method - when you stand over the cable, the signal is maximum, when deviating from the axis - the signal decreases.

In this mode the value of the depth and current in the communication are not displayed.



The cable route location shall be performed similarly to route location in the «Graph» mode, orienting on the maximum level of the signal on the lower scale of the graphic and minimum level of the signal on the upper scale. To determine the number of the nearby communications, you should step aside from the axis of the located cable and go straight across to the communication axis to visualize the amount and place of the route of communications.



Appendix 1
Receiver AP-019.1 Specifications

Parameter	Value
Receiver quasiresonant filter centre frequency	50(60)/ 100(120)/ 512/ 1024/ 8192 / 32768 Hz
«Wide band»frequency band	0.04…8 kHz
Frequency range "Radio"	8…40 kHz
Sonde frequency	512 Hz
Dynamic range of incoming signal	120 dB
Number of embedded sensors	4
Max. Sensitivity (in “Graph” mode: F0 = incoherent distortion +10dB is 31…35 kHz	5 mkA at 1m distance
Connected external sensors	CI-110(105), NR-117, DODK-117, DKI-117 (produced by Techno-ac)
Sensitivity control	Auto-for 2D display «Route» Semi-automatic or manual (optional) - for the «Graphic», “Graphic+”, MIN&MAX. Automatic or manual (optional)-for the «2F» mode.
Determination the burial depth of the route	Automatically in «Route» mode 0…9.99 m
Burial depth identification accuracy	±5%
Identification of the effective current in the route	Automatically in «Route» mode 0.001…9.99 A
Accuracy of identification of the signal current of the effective current in the route	±5%
Support of energy saving (intermittent) modes of the route locating generators	At combined work with the route locating generators made by "TECHNO-AC" ("Pulse" mode)
Visual indication	Graphic display LCD display, 320x240 pix., with LED backlight
Induced parameters	- 2D visualization of the route location relative to the device -Graphics of the signal level from sensors -Route burial depth -Signal current -Signal strength - Settings and control parameters
Audio indication	Built-in speaker: -natural filtered sound - buttons sound indication
Power source	4…7 V (4 type C batteries) External Power Bank – optional
Time of continuous operation from the single battery set	Not less than 20 hours
Automatic shutdown when the device is not active	After 30 minutes of inactivity
Operating /storage temperature range	-20…60 / -30…60˚C
Dust and water protection degree	IP54
Dimensions	330x140x700 mm
Weight	2,4 kg

Thank you for choosing Techno-AC equipment!!

- If you fave suggestions of improving the device's operation to your needs,
- you have proposals to improve technical documentation,
- You have any questions about device operation - email us to: marketing@technoac.ru

or call:

+7 (496) 615-16-90

We will to solve your in no time.